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THE PROCESS OF DIAGNOSIS

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THE PROCESS OF DIAGNOSIS.

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THE PROCESS OF DIAGNOSIS

INCLUDING

THE METHOD OF HISTORY-TAKING, AND PHYSICAL EXAMINATION OF SURGICAL CASES

BY

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PREFACE.

IT has been the aim of the author in preparing this book to show the application of some of the general principles of logic to the making of a diagnosis. Determining what is the trouble with a patient is essentially a process of reasoning. Many doctors reason well, but others do not, and their patients suffer the consequences. Some "people see, hear and feel all their lives without really learning the nature of things they see. But reason is the mind's eye, and enables us to see why things are, and when and how events may be made to happen and not to happen. We all must reason well or ill, but logic is the science of reasoning and enables us to distinguish between the good reasoning which leads to truth, and the bad reasoning which every day betrays people into error and misfortune."—*Jevons.*

In the part on history-taking, an attempt is made to describe some of the difficulties with which the lawyer has had to contend in obtaining the truth from a witness on cross-examination and to show how these same difficulties must be faced by the student or physician in taking a history.

Some years ago, the author published a booklet on the "Physical Examination of Surgical Cases."

In revising this the author has described a general method of inspection and palpation and applied this to the commoner types of conditions. The standard method of inspection, palpation, percussion and auscultation has long been in general use. The author has gone further and standarized the steps to be taken in inspection and palpation. By such a method, the examiner has a definite objective and knows for example that when he has looked for all the changes in colour, form, motion and sensation, his examination by inspection is complete.

With the object of supplying the student with some idea of the books that have been written on Surgical objects, a list of those published since 1900 has been prepared. This should enable him to quickly find and look up any details which are not available in the ordinary text-books.

The book has primarily been prepared for medical students when they are beginning their study of Clinical Surgery, but it is the hope of the author that it may assist more advanced students and members of the medical profession in making diagnoses with greater ease and more accuracy.

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PART ONE

THE PROCESS OF DIAGNOSIS.

ALTHOUGH the making of a diagnosis or determining what is the trouble with a patient has been and is carried out daily and hourly by the members of the medical profession, it is a remarkable fact that the exact way in which they do it, has not as yet been published. It is therefore with some temerity that the writer approaches this subject in an endeavour to describe the process. The subject is primarily prepared for the use of medical students when they begin the study of the clinical subjects, but it may prove of interest to the profession as a whole to learn some of the principles underlying the methods which they are already using in their practice.

As student-adviser of a class of two hundred students in the session 1920-21, it was discovered by me that many of these students had no clear-cut method of study and the writer began advising them in accordance with his own ideas on this subject. It became a question in his mind whether he knew what really was the proper way to study and after considerable difficulty and search, he found what appeared to be the under-

lying principles. These are fully described in "The Process of Study" and consist in—

1. The having of an objective.
2. The Collection of Data.
3. The Selection of important facts and discard of unimportant ones.
4. The Organization or Grouping of the important facts according to their relationship.
5. The Assimilation of this Organized Outline by the Memory.

While doing this, it was realized that precisely the same method or principles were applicable to the study of a patient for the purpose of making a diagnosis.

Thus the following steps are taken:

1. The objective is to determine the diagnosis.
2. The collection of data is carried out from the history, physical examination, textbooks, memory, etc.
3. The selection of important and discard of unimportant signs and symptoms.
4. The organization or grouping of these facts according to their relationship.
5. The making of the diagnosis.

Books on Diagnosis describe the first four steps from different points of view and in the minutest detail but they fail to tell how to take the fifth step or make the diagnosis.

SYSTEM AND CONCENTRATION OF ATTENTION.

There is no procedure in which the cultivation of a system is of greater importance and value than in the making of a diagnosis. "You can take the greatest possible advantage of your capacities with the least possible strain by cultivating system." (Osler). In the absence of a system, prominent facts may be overlooked, observations may be misinterpreted and the result cannot be otherwise than unsatisfactory. The student will soon notice that one clinician uses one method while another has an entirely different one. He must not infer from this that system is of no value, but rather that each man has had to develop a system of his own, as no one system has as yet been devised that will meet the approval of all. The student should work out a system of his own, therefore, and it is the hope of the author that the principles laid down in this book may be of some assistance to him in the accomplishment of this end.

"The diagnostician looks through his patient with his mental eye, aided by every possible clinical and laboratory method, and tries to unravel the whole condition of the man." (Rudolf).

As the doing of this efficiently involves the solution of a difficult problem, and as the result is of such serious moment to the patient from the standpoint of prognosis and treatment, it is essential that the student or physician should cul-

tivate to the full the habit of concentrating his whole attention on the case under examination. This concentration is necessary from the time he begins taking the history until he has completed the differential diagnosis. Any relaxation may cause him to lose the thread of the history or to overlook some important fact in the physical examination, in consequence of which the final result may be altered. The student should use every available opportunity for practising this concentration in making a diagnosis as in this way only will he be able to form the habit. "Every art requires experience. You cannot become a good painter, sculptor or shoemaker by the mere reading of books, much less can you be a good physician without being experienced." (Paracelsus).

"The discovery of the cause of the symptoms from which a patient is suffering is of the greatest value, because, if the cause can be corrected or removed, it should lead to the recovery of the patient. Even when the causes are beyond our control, it may enable us to select judiciously the therapeutic measures by which are brought about those adjustments which relieve suffering and prolong life."

Nomenclature.—It is necessary when making a diagnosis to give a name to the morbid condition. The recognized names of disease are unfortunately not "based on any coherent principle" and therefore the student is somewhat confused

by the terms which he meets as he reads his text books.

As this fact produces uncertainty in the minds of students beginning their study at the bedside, a brief description of some of the sources of these names may help to clear this away and enable them to learn with care and accuracy the recognized name of each condition. Certain names that at one time fulfilled their purpose have, as the result of progress, lost a good deal of their original significance, but tradition is as yet too strong for them to be thrown into the discard.

The following list indicates the ways in which some of the well-known diseases have acquired their names:—

1. From the addition of "itis," indicating inflammation, to the anatomical name of the diseased part, e.g., bursitis, synovitis, osteitis, peritonitis, etc.
2. From the addition of "oma," indicating tumour, e.g., osteoma, adenoma, fibroma, myoma, lipoma, etc.
3. From some particular symptom, e.g., torticollis (wry-neck), scoliosis (curvature of spine).
4. From some characteristic pathological change, e.g., abscess, ulcer, fistula, hernia, fracture, wound, etc.
5. From the cause of the disease, e.g., burn, bullet wound, bedsore, varicose ulcer, tuberculous knee, actinomycosis, etc.

6. From some disturbance of the physiological function, e.g., intestinal obstruction, paralysis, enuresis, lock-jaw, etc.
7. From the resemblance of the diseased part to some common object, e.g., hammer-toe, club-foot, hare-lip.
8. From the name of the observer who first described the disease, e.g., Pott's fracture, Raynaud's disease, Grave's disease, Paget's disease of the nipple.

As a rule, the name which indicates the etiological factor causing the condition, the type of pathological change, and the anatomical part in which this is occurring, is the most satisfactory one and where available should be used.

The Process of Diagnosis.—The following outline of the process to be carried out in the making of a diagnosis will serve as a guide to the student in the development of a system and method of his own.

The process may be divided into the following factors:—

1. The collection of the data of the case.
2. The selection from those collected of the facts of importance in accordance with their significance followed by
3. The organization or grouping of those selected.
4. The making of the diagnosis.

I.—THE COLLECTION OF DATA.

In the collection of data for the purpose of making a diagnosis the student should be careful that all his observations are accurate and exact as well as thorough and adequate. Single observations should be made *purposefully*, completing each procedure before advancing to the next, so that repetitions of examinations can be prevented. He must be certain that no facts are missed and avoid having subsequently to offer the excuse "I didn't notice so and so." Sir William Jenner truly said: "More mistakes are made by want of looking than by want of knowing." As he gains clinical experience, the student will learn "what facts to look for and in what direction to pursue his investigations."

Every possible source from which data may be derived, should be sought and utilized as the tendency to base the diagnosis on one single method of information will inevitably lead to the committing of fatal mistakes.

The common sources from which data may be collected are as follows:—

A. History of the case.
B. Physical Examination.
C. Memory.
D. Imagination.
E. Reading of Books or References.
F. Consultation with others.

A. and B. The methods of History-taking and

Physical Examinations are described in Parts II. and III.

C. Memory.—The student at the beginning of his clinical years, having had no experience with diseased individuals, is not in a position to use his memory to recall any knowledge he might have gained from former cases. His object therefore should be to acquire experience of this kind as soon as possible. Each case he sees should become deeply impressed on his memory so that he can recall it when the occasion arises. Impressions of memory of cases are more or less intimately related as they are created and recall takes place through association of some sort Some feature of the history or physical examination of the case under consideration recalls an impression of a similar feature in a former case; the recollection of this case brings back its other features and possibly those of another case, and so, in this way, an experienced doctor is able to use his memory of past cases to the fullest advantage in the making of a diagnosis. As it would be practically impossible for a man with a large practice to retain a complete record of the details of all his cases in his memory, rather than trust to it he keeps a written record of each case throughout its course. The student will find that by careful and diligent examination of the cases he sees in the wards or out-patient departments of the hospitals, he will gradually accumulate experience of his own; and as his ability to remember cases is as yet undeveloped, he should make

a habit of keeping brief written notes of the salient features of each case. The mental impression created by each one will be much more permanent, if the student purposefully and consciously undertakes each part of the examination himself; if he sees what is present with his own eyes instead of taking somebody else's word for it; if he feels any variations in the consistency of the part with his own hands; if he hears any peculiarities of the sounds with his own ears; and if he uses his mental faculties to select and organize the important facts and to identify them with some known disease. By carrying out such a method the student will soon reach the stage when he will find his memory a most useful source of data for diagnostic purposes.

The frequency with which he will use his memory of the fundamental medical sciences of anatomy, physiology and biochemistry, in distinguishing the abnormal from the normal form is obvious. His memory will also be most useful in enabling him to apply to the case he is examining the general principles of pathology, which he is at the same time studying in the laboratory.

D. Imagination.—The student must repeatedly bring his imagination into play in arriving at a diagnosis. He must learn to use this function of his intellect in interpreting the various signs and symptoms that present themselves and in identifying the disease present.

For example, in examining a thigh swollen from acute inflammation, he should imagine he

can see through it and recognize what substances are there which would not be present under normal conditions. He should be able to imagine that he sees scattered through the subcutaneous tissues and muscles, serous fluid with occasional masses of fibrin, many polymorphonuclear leucocytes, a few red blood corpuscles, many dilated capillaries with the blood flowing through some more rapidly than normal, through others more slowly and in others with the flow stopped. Similarly when he palpates the thigh, he should imagine that he can feel the above materials in the tissues causing them to be tight and stretched; and when he produces pitting on pressure, that he can feel his finger actually displacing the fluids away from the tissues beneath it and on its removal he can see the fluid slowing oozing back to its former location. Or again when he elicits tenderness he should imagine that he can see the exaggerated impulses, which he has set up by pressing on irritated and inflamed nerve endings, travelling up the different nerves to the spinal cord, from there on to the cerebrum, back via the efferent upper and lower neurones to the point pressed upon and interpreted by the patient as tenderness in this area. These few examples merely serve to illustrate the enormous field that is open to the student for the use of his imagination in the interpretation of symptoms.

In a case such as cited above he may say "I will imagine that this swollen leg is due to an abscess beneath the deep fascia on the back of the

thigh. What would be the result and effect on the leg of an abscess in this location?" "I know that extending the leg at the knee would put the flexor muscles in a state of tension and that this would increase the tension in the abscess and thus increase the pain." If the extension of the leg is not interfered with and no pain results from putting the leg in this position, then he may presumably conclude that an abscess, if present, is not affected by the change in the tension of the muscles. The imagination is repeatedly used in developing hypotheses to explain either certain signs and symptoms or the whole condition of the patient.

This step in the collection of data must be taken by the student himself, as it is obviously impossible for any one else to use his imagination for him.

E. The Literature on the Subject.—The student trying to diagnose a case at a hospital or home has not immediate access to his books and must depend largely on his memory in order to reach a temporary decision. In the early part of the clinical work, as he has very little knowledge of disease stored away in his memory, he will experience considerable difficulty in the solution of such a problem, so he should withold his decision until he has an opportunity of collecting further data from books on the subject. For example, he may wish to learn whether he has omitted to ask for a history of any prominent symptoms or to carry out some particular part of the physical

examination or to make some laboratory tests. He may be unaware that certain symptoms are closely related to one another and can be grouped together. Some characteristic sign may be absent, but he finds in a standard book that such is not uncommonly the case.

Numerous examples might be given, but the student can easily see that he will require to consult medical books very frequently if he wishes to become proficient in making a diagnosis. He should therefore familiarize himself with them so that he can quickly locate the material for which he is looking. He should also obtain a working knowledge of the reference books and journals so that he can consult them when the occasion arises. He will find on visiting medical libraries that facilities are provided for quickly looking up the literature on any subject. Reference to articles appearing in recent journals are to be found in such publications, as the Index Medicus, Index of the Surgeon General's Department of the U.S., Index of the Journal of the American Medical Association, or the British Medical Journal or Lancet and so on.

"In order to look up the literature on a certain subject or case, the student should develop a general knowledge of the standard reference books. In referring to these he should look up the table of contents or index for the headings under which he considers he will be likely to find the data that will help him to solve the particular problem he has before him."

"In reading each reference the particular fact or group of facts about which he is seeking information must continually be kept in mind. He should remember that he is not reading for information in general and therefore be prepared to skip what is irrelevant. His 'mind should pass lightly over all that is not relative to his search. and swoop like a hungry hawk upon everything on any page that is associated with the quest in hand.' "

There is no more fascinating or profitable study than that of the recent publications on some subject in which one is interested. The student should develop the habit of applying this method in order to get the right perspective with regard to Medical Science.

F. Consultation.—The practising physician at times finds in spite of the most thorough and careful investigation of a case that he is unable to make a diagnosis and so he calls in a man with a more extensive experience to assist him in reaching a decision. A student working in the hospital may reach the end of his resources and apply for assistance from one of his fellow students who brings out points that were missed in the history or physical examination and thereby clears up the case. He may be unable to get enough in this way and consult the interne or attending physician. They may be unable to settle the difficulty until further data is collected. The student should never hesitate to consult those with more experience than himself, as only by so

doing will he be able to obtain the different points of view from which a case can be approached. Such a step is in no way a confession of ignorance but rather an indication of his sincerity in endeavouring to solve the problem of the case before him. Even though he may consider that he has supplemented fully all the aspects of the case, he will often find that the one point necessary to clinch the diagnosis will be supplied by consultation.

II. SELECTION.

While he is carrying out this collection of the data of a case, the student has to select the facts of importance and to discard those of little relative value. This can only be done efficiently by carefully judging the soundness or worth of each of the symptoms and signs found. While taking the history and making the physical examination, he may be able to develop at an early stage by the use of his imagination and memory some hypothesis as a basis for this process of selection. It is a valuable practice to jot down each one of these possible diagnoses at the time it crosses the mind and then later compare them with the final conclusion in the case. "The construction of such a hypothesis serves a useful purpose in many ways giving an approximate conception of the disease. It stimulates the search for proofs and gives a line to follow in the search. Defective or false or useless as in the first instance it may prove to be, yet even as a

step, it is of advantage in directing our attention to the relation of symptoms and the need for a better interpretation of them." (Mackenzie).

A careful and exact interpretation of the significance of each sign and symptom is necessary before it can be determined whether its presence is of value or not from a diagnostic standpoint. A classification of the mechanism of production of signs and symptoms is a great aid in the selection of those of importance and the discard of those of little relative value. The following classification is one described by Sir James Mackenzie. Symptoms and signs occur in a patient as the result of:—

(1) Changes in the structure of a part, called the *Structural Group;* e.g., in the history, the patient complains of alterations in colour, appearance, shape or size of the part; or on physical examination, changes in colour, shape or size are seen on inspection, while induration, pitting on pressure or fluctuation, etc., are found on palpation.

(2) Disturbances of the function of an organ or part, called the *Functional Group;* e.g., in the history the patient complains of inability to move his arm or leg or to swallow or to pass water or to evacuate his bowels; or on examination movement of an arm or leg is prevented by spasm of muscles or adhesions in a joint, or a cessation of the flow of urine is found from obstruction of the urethra by a stricture.

(3) Disturbances of the normal reflexes of an organ or part, called the *Reflex Group;* e.g., in the history a patient complains of an attack of vomiting as the result of an impulse set up by an acutely inflammed appendix, while on examination the right rectus muscle is found markedly rigid from an impulse travelling from the appendix through the autonomic nervous system to the spinal cord and back to the muscle via the intercostal nerves. "The whole economy of the body is built up of a system of organs whose activities depend on reflexes. The interplay of these reflexes results in the harmonious action of the organs of the body which we recognize as "health." The disturbance of one or more of these reflexes results in a disharmony which we recognize as symptoms of disease. This Reflex Group is responsible for the production of the vast majority of the symptoms of disease. (Mackenzie).

"The meaning that is attached at the St. Andrew's Institute for Clinical Research to the term "reflex" is that vital process by which a stimulus passes from one tissue or organ to another, resulting in a response. The nature of the response depends on the function of the organ stimulated. In this definition of the reflex process, the manner in which the stimulus is conveyed from the receptor cells to the effector cells is not men-

tioned. Hitherto it has been assumed to be by nerves, but nerves are not necessary to the process, for other tissues may convey the stimulus.

"The nature of the process we call a reflex can be gathered by the description given in Bayliss's Principles of General Physiology of the evolution of the nervous system. This system begins in the conduction of a stimulus, where the communication passes from cell to cell without any intermediate mechanism. The next stage may be seen in the sea anemone, where projections of the cutaneous cell are connected with the muscle fibres.

"The next stage may be considered to be that when a nerve cell is interposed, the stimulus arising in one cell (the receptor or A part of the reflex) passes to a nerve cell (the centre or B part of the reflex) which is connected with organ which gives the response (the effector of C part of the reflex). It will be seen that this description of the evolution of one part of the nervous system deals with the passage of a stimulus from one tissue to another, corresponding with the above conception of a reflex."

An exact interpretation of the significance of each sign and symptom enables us to determine its value. For example, if the significance of an area of bright redness, which disappears on light pressure and returns immediately this is removed, is that this redness is due to an active

hyperaemia, then this observation is of definite value; whereas, if the redness did not disappear on pressure but could be washed off, its significance in determining what pathological process is present is absolutely valueless.

III. ORGANIZATION.

The important points selected are then to be organized by grouping together the facts that are closely related to one another. "In seeking in any given case for the causation of a group of symptoms however far apart they may be in situation and however diverse in character, it is far more probable that the nexus will be found, not in a diversity of causes producing the symptoms severally, but in some condition capable of producing the group." (Mackenzie). One group might consist of the observations on the history and physical examination that refer to the Anatomical structures involved; a second, of those which indicate disturbance of the Physiological function; a third of the symptoms and signs that are due to the local pathological changes; and a fourth, of the Constitutional findings that have resulted from or are responsible for the local condition. These groups might again be bracketed according to their relationships to one another and this procedure continued until an organized outline of the whole case is completed. For example, in the case of abscess of the thigh, in the first group there would be the patient's story of the position

in which the pain, swelling and redness had developed and the findings on physical examination as to the extent of the swelling on the thigh, of the involvement by the process of the skin, subcutaneous tissue, muscles, nerves, vessels or femur. In the second group, there would be the history of gradually increasing difficulty in walking from the pain caused by extending the leg at the knee and the finding of pain on attempting to carry out extension passively. In the third, there would be the history of redness, swelling and pain in the thigh and the findings of active hyperaemia, induration, pitting on pressure and fluctuation. And in the fourth, the history of fever, malaise, headache and thirst, and on examination, elevation of temperature, increased pulse rate, dry lips and skin, coated tongue and sick drawn expression. As the first, second and third groups bear a definite relationship to one another, they can be grouped together, while those in the fourth group remain as indicating the constitutional changes which have resulted from the local process.

Although the grouping in the above example is simple and straightforward, many cases occur in which it is a much more difficult procedure, and even by an experienced practitioner it is only by a careful interpretation of each of the observations and by judicious comparison of the relative value of each that an organized outline can be formed. In certain cases the student will find it impossible to constitute a correlated outline and

he will then have to postpone arriving at a diagnosis until other methods of examination are carried out or further signs and symptoms develop.

IV. THE MAKING OF THE DIAGNOSIS.

Having completed the steps of Collection, Selection and Organization of the facts of a case, the student is in a position to take the fourth step or to make the diagnosis. The accomplishment of this, involving the weighing of evidence and the drawing of conclusions, depends on the use of certain logical principles. "True diagnosis is an orderly procedure in which all the faculties of the mind, logical and intuitive play their part." (Head). "A physician must above all be in possession of that faculty which is called Intuition, and which cannot be acquired by blindly following the footsteps of another; he must be able to see his own way. If you wish to be a true physician you must be able to do your own thinking, and not merely employ the thoughts of others. What others may teach you may be good enough to assist you in your search for knowledge, but you should be able to think for yourself, and not cling to the coat-tail of any authority, no matter how big-sounding the title of the latter may be." (Paracelsus). Logical principles are being applied and conclusions reached daily by students and practitioners, without their realization of the various steps involved. As the result of this igno-

rance, certain safeguards or possibilities may be overlooked, which otherwise might be utilized to render their work more conclusive.

The two principles of Logic which are used in the making of a diagnosis are:—

A. Classification.

B. Induction.

A. Classification.—Things are classed together whenever we observe that they are like each other so that we think of them together. Things which have in common certain characteristics or uses or functions are regarded as possessing membership in a single class. A number of different classes may be regarded as belonging to a "higher" or more inclusive class; with the result that a Classification is developed extending from the highest one of all down to the one with the most refined particulars which our industry and interest may lead us to discriminate. When one class includes certain other classes (e.g. Inflammation—Acute or Chronic; Hernia—Direct or Indirect; Fracture—Simple or Compound) the more inclusive class is spoken of as *Genus* and each of the included classes as a *Species*. The features which serve to distinguish one species from another are spoken of as Differentiae of those species. Practically it is easier to distinguish between members of two species than it is to say definitely by what differentiae the distinction is actually made, e.g., a student soon learns to distinguish between acute and chronic inflammation, but it is not so easy to lay down the

exact points of difference which serve to distinguish any acute case from any chronic one. Similarly in diagnosis, the student must have such a knowledge that he can state the precise points which he finds in a case, which serve to distinguish between its being a condition of this disease or of that. If he finds that his observations of the case correspond closely and can be readily identified with the characteristic features of a definite disease, he then decides that this must be the disease from which the patient is suffering. In thus making a diagnosis directly, he is using the process of Classification.

Just as in the sciences, Classifications have been developed which delineate precisely the differentiae which best serve their purpose, so, in the Science of Medicine as seen in the text-books, classifications have been constructed as the result of observation and experience, which delineate the differentiae, by which the various diseases are distinguished.

In actual experience, the carrying out of classification always involves a problem. In solving such a problem, three aspects may be distinguished (a) on the intellectual side one has an equipment of concepts or class notions; (b) a situation or phenomenon is met with, the whole or a portion of which is the subject of inquiry for the purpose of classifying it; (c) by an intellectual process one must decide what concept best suits the point at issue, i.e., with which concept should the observed material be identified in order

to relate this instance to the general body of our experience and knowledge.

In making a diagnosis, a problem of the same type is met with.

1. On the intellectual side, the student has an equipment of class concepts which he has acquired from two sources; first, from the study of anatomy, physiology and psychology of the normal human being; and second, from the study at the bedside, in the laboratory and in the text books of the pathological processes that affect the structures and functions of the body and produce the signs and symptoms which are recognized as the indications of the abnormal or diseased human being.

2. The situation with which he is confronted and which is the subject of inquiry with the object of classifying it, is an individual showing certain signs and symptoms or indications of disease.

3. By an intellectual application of the principles of logic, he has to decide to which concept or disease this particular case belongs.

The observation of a case by the beginner often reveals only a portion of the significant symptoms which might characterize any of several conditions. In other words, observed findings are not sufficient even to determine the Genus of the condition for to do so would merely be guessing. If his observed data bear a resemblance to two or more diseases, then he must undertake to ascertain with which one of these the case he is

considering can most logically be identified. For instance, a local swelling in the inguinal region of the abdominal wall might be recognized as belonging to the Genus hernia. Then it would still remain for the student to determine the Species of hernia and tests would be suggested for his knowledge of the Differentiae which distinguish

(a) Direct or indirect.
(b) Reducible or irreducible or strangulated.
(c) Enterocele or epiplocele.

Thus in conducting the identification to its finality, the student must use his concepts of pathological conditions and ultimately by applying tests according to the methods of induction should be able to identify the case. The procedure by which he does this forms the second logical principle used in diagnosis, called Induction. This step is commonly described as the making of a Differential Diagnosis.

B. INDUCTION.

While Classification is relating through identification and grouping, Induction is relating through discovering and demonstrating what is the cause of a certain effect or phenomenon or what is the effect when a certain cause is present. It is essentially a process of observation and experiment in which a calculation is made of the conditions and the degrees of their connection with the object of showing their relationship.

As examples of the simplest method of reasoning, the following might be cited:—

A. (1) Redness that disappears on light pressure and reappears again at once is due to hyperaemia.
(2) This patient has an area of redness that disappears on light pressure and reappears again at once.
(3) Therefore, this patient has an area of hyperaemia.

B. (1) Swellings that pit on pressure are due to oedema.
(2) The swelling in this patient pits on pressure.
(3) Therefore, the swelling in this patient is due to oedema.

From an examination of these examples, it is apparent that we learn, infer or reason from one or more facts to other facts; that from the use of some knowledge that we possess, we are able to interpret other facts by a process of reasoning.

In the above examples of arguments, the first two statements or propositions are called the premises; the third is the conclusion which is logically inferred from the relationship of the first two.

In disease, certain causes produce certain definite symptoms and signs or effects. In the use of induction in diagnosis, we endeavour to discover what the cause is of the signs and symptoms of the case under consideration. The immediate cause of the signs and symptoms in any case is the pathological process which is taking place in

a local area or in a certain system of the body or in the body as a whole. The original cause is the etiological factor which is producing such a pathological change. In making a diagnosis we first endeavour to identify the pathological process that is causing the symptoms and, having determined this, to ascertain what is the original cause of this process.

In one group of cases, we learn what the original cause is from the patient in taking the history, such as a wound from a knife or bullet or a fall or blow, under which circumstances the problem for us to solve is to determine what pathological changes have resulted from such a cause as indicated by the signs and symptoms we have found on examination.

In another group, we are able to calculate from the findings on examination of the patient what pathological process is responsible for them, but medical science has not as yet discovered what the original cause is of these pathological changes; for example, we may decide from the signs and symptoms that the appendix or gall-bladder is inflamed or that an ulcer is present in the duodenum and yet we cannot explain why this change should have occurred in this particular part at this time.

In a third group, we are able to determine both the original cause as well as the immediate pathological one. In this determination of either the immediate or the original cause, the process of induction is repeatedly applied. There are four principle methods by which casual relations may

be sought by Induction. The relation of cause and effect is determined from the result that follows on the inclusion or exclusion or modification of one of the factors, which are thought to be causally related, e.g., if the effects 1-2-3 are consistently present as the result of the causes A-B-C; and if whenever the cause A is omitted, the effect 1 is absent, and if A recurs, the effect 1 recurs also, then it is concluded that the effect 1 is related to the cause A.

The Methods or Canons of Induction are known respectively as:—

1. The Method of Agreement.
2. The Method of Difference.
3. The Method of Residues.
4. The Method of Concomitant Variations.

The principle of each method is stated below, and should be applied for practice by the student in both his ordinary experience and in his laboratory work, so as to familiarize himself with each of the procedures and their respective values in order that he may readily recognize what method or combination of methods can best be used to determine a point in question.

1. Method of Agreement.—In this method, the evidence of relationship between cause and effect consists in the fact that the presence of one factor is accompanied consistently by the presence of some other. For example, if we are examining a case in which the effect or signs present in the patient consist of an area which is bright red in colour, which is warmer to touch than the sur-

rounding parts, which blanches on light pressure, immediately becomes red again on the removal of the pressure, then we can conclude as the result of previous observation, experience and experiment of a similar condition, that this effect has been caused by an active hyperaemia with its dilated capillaries and increased flow of blood.

Another example would be the determination that oedema or fluid in the tissue spaces is the cause when the sign or effect found on examination is pitting on pressure.

This method is really applied to the type of case in which classification is carried out directly as under such circumstances all of the factors being intimately related can be grouped as belonging to a single class both as far as effect and cause are concerned.

2. Method of Difference.—In this second method, the evidence of relationship of cause and effect, is based on the fact that although two conditions agree in most particulars, there is present one important point of difference.

The application of this method might be illustrated by a case in which the findings in the history and examination point to one or other of two conditions, but in which one important factor of difference is elicited. On the existence of this factor, the difference in the resulting diagnosis is based.

Example (two):—A girl, age 20, has a lump on the upper part of the chest wall just below the inner end of the clavicle, which has gradually de-

veloped during the last six months. There is slight passive hyperaemia present, slight pitting on pressure, mass is globular in shape and not nodular; there is no fluctuation.

X-ray shows some rarefaction of the inner end of clavicle; no definite history or other signs exist of either tuberculosis or syphilis. In other words, the condition present agrees in practically all its features with either of these two conditions. On examination of the blood, a strongly positive Wassermann reaction is found. This one point of difference points definitely to a diagnosis of Syphilis and excludes Tubercle as the cause. The correctness of this diagnosis is verified by the lump rapidly disappearing under syphilitic treatment. This case has been diagnosed by what is known as the Method of Difference.

3. Method of Elimination or Residues.—In this method, the result is attained by eliminating or excluding in turn, on the basis of knowledge gained by previous inductions, all of the possible causes with the exception of one; this one which cannot be excluded is considered as the cause of the condition found.

Example (three):—A man, aged 45, comes with a history of a lump on one side of his neck which has been developing slowly for the past year. The argument in arriving at a diagnosis might be described in the following terms:

If the cause were a pyogenic infection, the signs of infection would be hyperaemia, pitting on pressure, fluctuation, and it would not have had

a history of continuing a year without forming an abscess. As these signs have not developed, pyogenic infection as a cause may be excluded.

If the cause were a tuberculous infection, the mass would likely have undergone caseation and liquefaction and ultimately ruptured through the skin and formed a sinus. The condition would have extended to the other glands of the neck. Such a condition is not common in a man of this age. As the case has not followed this course, tuberculosis as a cause may be excluded.

If the cause had been syphilis, there would probably have been a history of infection or of other syphilitic lesions. The examination of the blood shows the Wassermann reaction to be negative. On this basis, syphilis may be excluded as a cause.

If the cause had been Hodgkin's Disease, the glands elsewhere would be enlarged and characteristic blood changes would be found. As these signs are absent, Hodgkins Disease can be excluded.

The only other cause, which commonly would produce a lump in this location, is some form of new growth or tumour formation, and by a process of elimination, we are forced to make a diagnosis of this condition. In a man of his age, the probability would be that the mass was of carcinomatous nature. Verification of this diagnosis would consist in a microscopic section of a piece of the mass removed by operation. This case

might be said to have been diagnosed by the Method of Elimination.

Method of Concomitant Variations.—In this method, if the effect or sign varies in a certain manner, whenever the cause varies in some particular manner, then this effect is connected with this cause in some way.

This method is somewhat the same as the Method of Difference in that in the latter the factor is totally eliminated, while in this one, only a variation occurs. This variation may be one of quality or of quantity.

Examples of this method occur in the differing degrees of redness in acute and chronic inflammation; or the different effects that result from infection with either a pyogenic organism or the tubercle bacillus; or the varying severity of infections with the same organism, one causing a mild attack, another. a severe one.

THE DELAYING OF A DECISION.

Even after the most exhaustive examination, the student or even the experienced physician may be unable to arrive at a definite conclusion as to the diagnosis, in which circumstances he should delay judgment until he is able to obtain more data either by further methods of examination or by watching for additional signs and symptoms as the case develops. In certain cases, it being considered that any further delay may jeopardize the life of the patient, exploratory operation is

advised for the purpose of obtaining further data which may determine the diagnosis. The particular pathological lesion that is found is treated at the time of such an operation.

"When a man, in previously perfect health, is taken with some acute disease, the diagnosis under a single name may be fairly correct. The patient is like a new motor car that suddenly breaks down. In all probability here there is only one lesion, and when that is corrected, the car will be as good as ever again. In civil practice we are only too often dealing with people who are not originally healthy, and when these are taken ill with even the simplest of conditions they are like C. A. M. C. "Jitneys," which, when they break down at last, are found to have many weak spots besides the final lesion." In patients like these, many systems are involved and this fact should be expressed in the diagnosis.

"The danger of summing up a condition in one word is that we are all too apt to think that a final diagnosis has been reached when such a name has been appended. These names should not be considered as goals, but merely resting places on the road to a more detailed diagnosis." —(*Rudolf.*)

Summary.—Diagnosis consists in—

1. Collection of Data.
2. Selction of important and discard of unimportant facts.
3. Organization or grouping of related facts.
4. The making of the diagnosis.

(a) By the process of Classification.
(b) By the process of Induction.
Through (a)—The Method of Agreement.
(b)—The Method of Difference.
(c)—The Method of Elimination.
(d)—The Method of Concomitant Variations.
(c) The delaying of a decision.

PART TWO

HISTORY TAKING.

THE taking of a good history of a case is not an easy procedure. It requires considerable practice before the student can record the facts of a case in such a form that they will be useful either for the purpose of making a diagnosis or for preservation for future reference.

One man will put down too little and omit essential factors, while another will be so verbose that it is impossible to gain a clear idea of the salient points in the case. The principles described above under the collection, selection and organization of data should help him to arrive at the happy medium.

The taking of a history might be compared to the procedure in which a lawyer is questioning a witness as to the facts of some important event which he has recently experienced, called legally "evidence from testimony."

It is assumed, in the first place, that the witness or patient "observed the facts testified to, that his memory is accurate and that his testimony is an accurate transcript of his memory; or in other words, that the witness is trustworthy."

Bell: Principles of Argument. Canada Law Book Co., Toronto, 1910

"If, on the other hand, his testimony is inconsistent with itself or with other facts better established, or he seems to be biased by interest or hostility or his memory appears to be defective, then you doubt whether he is trustworthy and you cannot consider the history as of the same importance as if this were not the case.

"A second cause of error in testimony is a conscious or unconscious bias arising from interest, prejudice, or other motives whereby testimony is given a false color." For example, one patient will minimize or even neglect to tell of some symptom, because he thinks it would make him appear as a neurasthenic or a complainer or a weakling. Or, the opposite may occur of exaggerating some symptom because in his (the patient's) opinion its occurrence justifies his own theory as to what he is suffering from.

Another source of error lies in the patient's tendency to substitute inference for fact.

The patient, thinking he is suffering from a certain disease, often describes symptoms or signs which he imagines he had so as to make the conclusion he has reached appear justifiable. He infers that he must have had them, but if his memory of details is put to the test, it is found that he can produce no absolute evidence that such a fact was the case.

The greatest source of error lies in a defective memory. Patients "are especially liable (a) to confuse two different impressions and to transpose the order of things and the sequence of

events; (b) to have their attention unduly attracted by special signs or symptoms and so diverted from other parts; and hence where they have no distinct recollection, to invent details which seem to them probable, rather than say 'I don't remember'." (Bell).

"Nothing is more difficult than to tell the truth; that is to say, to recount the past, to make a deposition upon some fact, even if the fact be one which has come a great number of times under our own eyes." (Claparede).

When the patient has to recount an event, the circumstances of which he cannot quite recollect, the lapses in his memory are automatically filled by images which he borrows from other events, more or less analogous. The form of a question also influences the value of the reply that is made to it, as, by a leading question, an image is introduced into the mind of the patient which suggests the character of the answer expected. It must not be forgotten, therefore, that "memory has no resemblance to a safe with impenetrable sides in which our recollections remain carefully shut up. On the contrary, the impression which falls into our mind far more resembles the seed hidden away in the earth; it puts out roots and produces leaves and flowers. And it may happen before long, no trace can be found of the primitive seed which gave birth to all this vegetation."

"The unconscious sense impressions—sight, sound, or touch—would be the same to every human mind; but once you awaken the mind to

consciousness, then the original impression takes on all the color of motive, past experience, and character of the individual mind that receives it. The *sensation* by itself will be always the same. The variance arises when the sensation is interpreted by the individual and becomes a perception of his own mind. The interpretation of a sensation is, therefore, the act of the individual, and different individuals will naturally vary in their interpretations of the same sensation, according to their previous experiences and various mental characteristics."

Likewise, the same impression may be differently interpreted by the same individual at different times, due "in part to variations in his *state of attention* at the moment, and in the degree of the mind's readiness to look at the impression in the required way."

Mlle. Borst, by Steen's method, concluded that there were three possible degrees in the certainty of our recollections. Answers about past events may be given with hesitation, with assurance, or they may be certified under oath. "Out of a hundred replies given under oath, 92 were found to be correct; out of a hundred replies given with assurance, 86; out of a hundred uncertain replies, 56. In other words, the degree of fidelity of a hesitating witness, may be put down as 56 per cent.; of a confident witness 86 per cent.; of a

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Wellman: The Art of Cross-examination. New York: The McMillan Co., 1920.

sworn witness, 92 per cent. These results display evidence too favorably as those examined knew they were going to be tested and endeavored to fix the facts in their memory. A similar test applied to 54 students who had no warning, showed the average fidelity was 27 per cent.

Realizing from what has been said about the fallacies that occur in getting a truthful description of facts that occur in our every day existence, it is not surprising that we meet with difficulties in obtaining an exact account of the precise symptoms from which a patient has been suffering. The longer these have been in existence, the greater the probability of the facts being more indefinite and uncertain. Such being the case, any conclusion or hypothesis that we may develop from the history, must be given its proper relative value.

The practice by many physicians of giving the history 100 per cent. value and making a diagnosis on it alone and prescribing treatment in accord with this diagnosis is scarcely justifiable if the facts elicited really have only 27 per cent. truth in them. If the facts of the history are confirmed as truthful by the findings on physical examination being consistent with them, then no hesitation occurs in accepting them; but, if they are not confirmed by any positive findings, considerable doubt is thrown on their veracity and their value from a diagnostic standpoint is very materially reduced. On the other hand, the findings on

physical examination of some condition, without the history as to the way in which it developed or the effect it had on the individual, might lead to a mistaken conclusion. Both the history and the physical examination are essential preliminaries to making a diagnosis, and each is complimentary and correlated to the other.

Practice and personal experience are the chief methods by which proficiency in history taking can be obtained. Each history a student takes should add something to his knowledge and enable him to take a better one next time. Every opportunity should be seized by the student to work out the history of a case in order that he may feel a certain degree of confidence in himself when he has to undertake this step in practice.

"Cross examination," says Wellman in the "Art of Cross Examination," "requires the greatest ingenuity; a habit of logical thought; clearness of perception in general; infinite patience and self-control; power to read men's minds intuitively, to judge of their characters by their faces; ability to act with force and precision; a masterful knowledge of the subject matter itself; an extreme caution; and above all, the instinct to discover the weak point in the witness under examination."

Although the attitude of the patient to the medical man differs from that of the witness to the cross-examining lawyer, still the above principles may, to a large extent, be aptly applied to the art of history taking.

The following suggestions may also be of value to the beginner in enabling him to understand the reason why certain facts are required in practically every history.

1. **General Information.—**
   (a) Name—for the purpose of identification in case of death and so as to be able to fyle the records for future reference.
   (b) Address—for the purpose of identification in the case of individuals of similar names.
   (c) Date of Admission to Hospital—as an indication of the stage of his sickness that it was necessary to send him from his home into hospital. It is also essential so as to determine the length of time he has been in hospital when he is discharged or dies.
   (d) Next of Kin with their Address—for the purpose of notification in the case of the patient becoming seriously ill and likely to die, or for the purpose of discharge from hospital.
   (e) Age—Certain diseases occur at particular periods of life and the patient's age is useful as a guide to these diseases. It is also useful to be able to judge how the disease from which the patient is suffering will affect this individual at this particular age.
   (f) Occupation—This gives us an idea of the social status of the individual, of the type of life he leads and may suggest certain diseases that occur in certain occupations. The character of the work done, the ma-

terials handled, exposure to extremes of temperature, dust or moisture and any subjection to postural, muscular or nervous strain should be stated.

2. Chief Complaint.—The description of the present illness for which the patient seeks medical aid should cover the period from the time he noticed the first indication that he was not in perfect health up to the hour at which the history is being taken. Every endeavor should be made to record the facts in the order and sequence of their occurrence, so that the account will have definite continuity.

The reason for exactness in the description of the signs and symptoms that have occurred is for the purpose of determining at what stage, the particular disease from which the patient is suffering has arrived. It may enable the recorder to develop a hypothesis of the disease from the symptoms which occurred some time before, whereas the recent symptoms may give but a slight clue to it. The present complaint may be a complication or a sequela of an illness that took place at some former date. In view of the effort at the present day to recognize disease in its very earliest stages before the cardinal symptoms of the well-established disease have developed, the student should use every care in searching for these facts.

It may be possible to get an account of the original cause of the condition, which will form most valuable evidence in making a diagnosis. If

the cause has been an injury he should ask how, when and where the injury was received, as it is often possible to estimate from the description of it just what degree of damage might have been produced by such an injury. As a rule, a definite relationship exists between the severity of the injury and of the results found in the patient, but occasionally surprising exceptions to this rule occur. For example, two men were brought into the Hospital on the same day; one had fallen four stories in an elevator and received only a mild sprain of the ligaments of the knee; while the other only fell eight feet from a scaffolding, fractured the base of his skull and died the next day.

The student will find it extremely difficult to make the patient adhere to the sequence in which the symptoms develop, but he should persevere in his efforts, in order that his result be satisfactory.

The description should be one of fact only, and not the patient's inferences or opinions as to what it might be. If the patient's description of signs and symptoms is utilized, it should be put in quotation marks.

Every detail of the facts elicited from the patient on cross-examination does not need to be recorded. Judicious selection of the important facts that will have a bearing on the case should be made, and unimportant and irrelevant events omitted. The care and judgment used in this selective process often marks the difference between a poor and a good history. By practice

only, can the student obtain necessary knowledge that will enable him to select with facility.

3. Past History of the Patient.—Habits and social condition are enquired into with the object of ascertaining the sort of constitution the patient has and how it might be affected by leading such a life. Similarly a record of any previous sicknesses is obtained. These facts are frequently of great value in supplying evidence to explain the present illness of the patient, and also in enabling a reasonable forecast to be made as to how an individual, who has led such a life as that described, will be able to stand the illness from which he has at present sought relief.

These facts are useful in estimating how certain features of the treatment should be applied. A description of the the previous illnesses is very important, as they may be merely another form in which the present disease manifested itself, or they may have undermined the constitution of the individual, lowered his resisting powers and thus indirectly have led to the occurrence of the present illness.

4. Family History.—The student or physician after having obtained the present and past history of the patient, will often have gained some idea or at least formed one or more hypotheses of the probable cause of the present illness. The evidence in favor of or against one or more of these may be strengthened or otherwise by an account of the history of the various members of his own family. The purpose, therefore, of get-

ting this information is so as to be able to judge whether he has inherited any disease or any tendency to disease. One of the diseases which experience has shown is especially liable to run in families is Tuberculosis. It is now well established that this disease is transmitted from one member of a family to another by direct contact. There may be inherited from tuberculous parents a weak constitution, in which case the chances of being infected would be greatly increased. An individual whose brothers or sisters have been afflicted with Tuberculosis has been found to be more liable to contract it than one whose parents have had it.

Rheumatism is another disease which has a tendency to affect certain families. The particular form of the disease, i.e., whether it affects the joints, the muscles, or the nerves, is important, as the same type tends to be inherited.

Syphilis may have to be enquired into in certain cases where an infection of this disease is suspected.

Haemophilia is a blood disease that is transmitted through the mother to the male descendants. In a case giving a history of haemorrhages, either external or into the tissues, the family record should be enquired into.

5. Physical Examination.—"If a physician knows nothing more about his patient than what the latter tells him, he knows very little indeed, because the patient usually knows only that he suffers pain." (*Paracelsus.*)

After having completed the history and gathered all the facts from the patient, the student should be prepared to learn as much as possible by his physical examination of the patient. He should be very careful not to confuse the facts in the history or what are known as the Subjective Symptoms with what he finds on examination or Objective signs. The frequency with which these two aspects are mixed together is so common that it must be continually kept in mind so as to avoid it. The findings, seen, felt or found on examination are of the greatest value from the standpoint of diagnosis and their recording is especially important for the purposes of future reference.

If a patient returns to the care of a physician or to hospital, his Subjective symptoms may be obtained from him, but what the physician himself or the man who wrote the former history found on physical examination is absolutely lost unless it is fully recorded on the history. The physical findings may be the only ones on which the progress of the patient in the intervening period can be based. For these reasons, the following pages are written with the idea of assisting the student to develop a definite systematic method of carrying out this examination, and of suggesting some of the details of these methods, of which he, from his lack of experience, may not think.

Each man will have to construct a method of his own. The order of carrying out the local examination as described in Part III. is proposed as

a guide in the development of this.

General Examination.—Before undertaking the examination of the particular local area affected, the following general examination should invariably be carried out:

1. State of consciousness and intelligence.
2. State of development and nutrition (weight, if possible).
3. Facial expression—noting whether apparently well with good colour; placid expression or obviously sick with pallor, cyanosis, cachexia; rash or eruption; drawn expression from presence of pain or suffering; deformities.
4. Temperature.
5. Pulse—rate; rhythm; state of vessel walls; degree of tension; the rise, maintenance and fall of pressure during a complete heat.
6. Respirations—rate; rhythm and character.

Authorities vary in their advice as to whether the local area affected should be preceded or followed by a methodical examination of each of the body systems, but whichever method is adopted the important point is that it should be thoroughly carried out.

6. Diagnosis.—In recording the conclusion that has been reached in a particular case, it is excellent practice for a student to summarize the chief reasons for his having arrived at such a diagnosis. For instance, in a case of acute abscess in the thigh, it might be stated in somewhat the following manner:

In view of the history of the rapid development of a painful red swelling in the thigh which interfered with walking; of constitutional signs of toxic absorption; of finding on physical examination, a hyperaemic swelling of the right thigh which pitted on pressure, in the centre showed fluctuation and was acutely tender, limitation of extension and flexion at the knee joint; an elevated temperature and increased pulse rate; dry tongue and lips and sickly expression on the face; and a leucocytosis of 25,000, one is justified in making a diagnosis of Acute Abscess (Pathological Process) of the right thigh, lying beneath the extensor muscles and possibly under the periosteum (anatomical position) and causing the impaired function of the leg (physiological function).

After opening the abscess and taking a culture, the particular organism found would be the etiological factor.

The diagnosis should include the anatomical, physiological and pathological features, and, if possible, the original or etiological cause.

7. **Differential Diagnosis.**—The arguments, on the basis of which the various diseases resembling the one under consideration are excluded, should be clearly and concisely stated in a similar manner to that used in the examples on pages 33 to 37.

8. **Prognosis.**—It has been shown that the objective in making a diagnosis is to determine the cause when certain effects or signs and symptoms are found present. The objective in prognosis is

to predict what will be the outcome when certain effects exist as the result of a known cause. The process of calculation or predictive reasoning by which this is accomplished is known as ratiocination. By the observation and experience of previous observers, certain laws of the probable outcome when a particular disease is present, have been developed. The student therefore should acquire from his books and his own observation of cases a definite idea of the probable result in all of the commoner diseases. He must remember that he has not only to predict whether the patient will recover or die, but how long it will be before either one or other occurs, and also whether any after effects or sequelae will be left by the disease.

In order to do this satisfactorily, he must first have made a complete diagnosis of the case. He will then have to make a study of the personal and family history of the case to determine the strength or weakness of the constitution of the individual. He has to calculate from this how an individual with this type of constitution will stand the particular disease from which he is suffering.

The facts he selects from the data of the case for giving a prognosis may be quite different from those he selected for diagnosis. Just as in making a diagnosis, he must organize all the important factors that may bear on the outcome and, on a consideration of these, base his decision.

As disease is a progressive process, his opinion of the outcome may vary from day to day. To arrive at a sane decision he will have to use his

powers of judgment to their fullest extent, as any mistake he may make may cost him a valuable connection in his practice. He should, therefore, gain as much experience and knowledge of the results of the cases he sees during his undergraduate course, observing carefully the prognosis given in each case by the attending physician and surgeon, so that he will be prepared to undertake this step in practice with a certain degree of confidence. One of the most valuable sides of the recent graduate's experience as a house man in Hospital is his contact with patients and their friends when he is asked what the prognosis in the various cases is.

In many cases, it is practically impossible to decide what the result will be, under which circumstances a very guarded prognosis should always be given. Patients not infrequently judge the excellence of practitioners on their ability to give a prognosis which turns out to be correct.

9. Treatment.—(a) Non-operative.

Many surgical cases are treated by various methods which involve no operative procedure and the application of such treatment should be described in detail.

(b) Operative.

(1) Description of the technique carried out during the operation and of the pathological lesions found during its course. The form of anesthetic used, the location of the incision, the technique of any

special procedure, and the suture materials used should all be described.

(2) The confirmation or otherwise of the pre-operative diagnosis should be entered as evidence of the operative findings.

10. Progress Record.—(a) Immediate post-operative condition with any complications.

(b) Microscopical and bacteriological report on any tissue or fluid removed at operation.

(c) Further notes of the way in which the case progresses up until discharge from hospital or death.

11. Final Diagnosis.

12. Result.—A definite standard for the recording of results is more efficient and useful than general terms which vary with each recorder. A perfect result might be described as A; a good result as B; a poor result as C; and a very bad one as D.

In the case of recovery.

(1) Anatomical result. The character and degree of accuracy of the restoration of the anatomical condition should be clearly stated. If an operation was performed the perfectness or otherwise of the healing of the wound should be recorded.

(2) Degree of relief from symptoms and restoration of the normal physiological function should be recorded in accordance with the degree of change from a patho-

logical to a physiological condition as the result of the treatment applied.

(3) Economic. The ability of the patient to resume his former occupation with the date at which he will be able to do so are important facts from an economic standpoint.

By some such scheme as the above, records of cases would be vastly improved in their usefulness. Should the same patient return for a recurrence of his trouble, an exact estimate can then be made of the change that has occurred between the time the result was recorded and the present time. Records of cases from a statistical standpoint for the advancement of medical science would be greatly enhanced by some standard method of recording results.

(b) In the case of death.

A brief summary of the anatomical and pathological findings at autopsy should be entered on the history.

PART THREE.

PHYSICAL EXAMINATION.

EACH step in examining a patient is taken with the object of ascertaining if any definite change from the normal exists. The changes that occur as the result of disease show themselves by alterations of the following qualities:—

1. Colour.
2. Form.
3. Motion.
4. Sensation.
5. Sound.
6. Odour.
7. Taste (rarely resorted to).
8. Sight.
9. Hearing.

The senses with which we are endowed enable us to find out whether changes have occurred in these characteristics. For example, by inspection or sight we look for changes in (a) colour, (b) form, (c) motion, (d) sensation; by palpation or touch we feel for changes in (a) colour, (b) form, (c) motion, (d) sensation; by percussion, or hearing, we listen for changes in sound produced by a hammer or plessor; by auscultation or hearing

we listen for changes in the normal sounds of the heart, lungs, etc.; by osculation or smell we smell for changes in odour. Under certain conditions, we use a combination of two senses concurrently, such as sight and touch when we press an area of redness and watch its disappearance and reappearance; or when we move the fragments of a broken bone and hear the grating. Aids may be necessary in order to render easier of access certain changes that occur, such as the use of the cystoscope to see the inside of the bladder, the ophthalmoscope, etc.; or the use of the stethoscope of its various types to render sounds more audible. Although we are unable to actually see deeper structures except by operative means, radiology or the use of the X-ray enables us to see the relative density of the shadows they produce and any changes that may have occurred in their outline. These methods are therefore merely refined means of inspection or auscultation as the case may be.

It is considered that the above outlined principles form a basis on which the methods of physical examination might with advantage be standardized. If such could be accomplished, an enormous amount of time and energy would be saved by the student in learning one way applicable to any form of examination, instead of a special way for each condition or area. The adoption of such a standardization would result in more uniform results and in less numerous omissions.

Inspection is not simply looking at a part in a haphazard way and noting any changes that may happen to meet the eye, but should consist in looking with the object of seeing first if there is any *change in colour,* with its position, extent and shades; next, if any *change of form* exists such as swelling, etc. Similarly in palpating, each act is carried out for the purpose of ascertaining some definite fact. By such a method, results that are of importance will be reached quickly and accurately and repetition or the omission of examinations will be avoided. Sir William Jenner has truly said, "More mistakes are made by want of looking than by want of knowing."

The observation of a change is followed by a logical endeavour of the mind to interpret the significance or reason for the change. Each act in the examination should be carried out consciously and the attention so concentrated that the possibility of error or omission is reduced to a minimum. Although the examiner concentrates his faculties on some local area that he is examining, he must always remember that this area is only a part of and is intimately related to the individual as a whole. Each examination should be made in such a manner as to cause as little pain as possible in finding out the facts necessary to arrive at a conclusion as to their cause. By tactful management, embarrassment and mental distress of the patient can be avoided.

In carrying out the present recognized standard of examination of inspection, palpation, percus-

sion and auscultation, the following steps would be purposefully taken:—

Inspection—

1. For changes in colour.
2. For changes in form.
3. For changes in motion.
4. For changes in sensation.

Palpation—

1. For changes in colour.
2. For changes in form.
3. For changes in motion.
4. For changes in sensation.

Percussion—

For changes in sound.

Auscultation—

For changes in sound.

Occasionally, smelling would be used to learn changes in odour.

The combinations in which two senses are used concurrently would be learned by the student as the necessity for them arose and similarly with the special methods of examination.

The following description gives an idea of the details of an examination in applying the principles of colour, form, motion and sensation during inspection and palpation.

INSPECTION.

I. For Change in Colour.—The anatomical position of such changes is first noted. This should be followed by an appreciation of the limits and

shape of the area over which they extend and of the character of their limits as to whether they end gradually or abruptly.

The particular colour is noticed, such as red, brown, black, yellow or white. The variations in the shades of the colours in the different areas involved is observed, noting especially the area or areas showing the maximum degree of change. Other changes in the skin are looked for such as glistening, wrinkling, scaling or scarring; bubbles of gas may occasionally be seen in superficial blisters as the result of decomposition.

II. For Change in Form.—The commonest ways in which change of form occurs as the result of pathological changes are by swelling, or shrinking, irregularity or deformity. The anatomical position of such a change; its extent and size, are first observed. The character of its edges should be looked at to see if they end gradually and diffusely, indicating infiltration or sharply and abruptly, indicating encapsulation. The area of maximum change is also important. The character of its surface as to smoothness, roughness or irregularity (lobulated, warty, sessile, pedunculated, ulcerated, etc.) is noticed. The effect of movement on its position, size or shape is examined for; special movements, such as coughing, straining, swallowing are useful under certain circumstances. Pulsating movement should not be overlooked.

The degree of translucency may be of value in some cases, as scrotal swellings or involvement of

maxillary antrum. The degree of opacity to X-rays may be necessary in conditions of bone, joints, foreign bodies, calculi, or gastro-intestinal or urinary tract.

III. For Change of Motion.—The effect that movement has on the colour or form is noticed. The range and ability to carry out *active movements* of the affected part, such as arm, leg, abdomen during respiration is next observed, noting any limitation or excess that may be present with its degree.

The presence of any abnormal movement where it normally does not exist, as in fracture or in peristaltic waves in abdomen, or a peculiar character such as tremor or twitching is examined for.

Abnormal sounds may be heard during movement, such as grating in a joint or fracture, gurgling in the abdomen.

IV. For Change in Sensation.—Although the presence or absence of pain in a local area cannot be seen, the results of its presence may be shown in either the facial expression of the patient or in his position or habitus in the way of restlessness or stillness.

PALPATION.

I. For Change in Colour.—The temperature of a part showing a change of colour should be compared with a normal area to ascertain any difference that exists.

The fact that a colour may be made to disappear by light pressure is very valuable in determining whether the colour is fixed in the tissues or due to a circulatory change, such as hyperaemia. Colour due to local applications can generally be washed off or its presence explained by the patient.

II. For Change in Form.—An idea of the anatomical position of the change may be gained by comparing its position, relations and shape with that of normal structures or organs.

The anatomical position of the change is also estimated by determining its relation to the different tissue layers. The fact that a tissue layer moves freely over or separately from a swelling or change of form indicates that it is not involved by the swelling; and conversely, the more firmly a tissue layer is attached to a swelling, the closer its relation and involvement. Thus the examiner tries to move the skin over the change of form such as swelling; then he tries its movement in relation to the muscles, bones, joints, viscera, etc.

Measurements may be used to give the exact degree of any alteration in the relations of bony points to one another.

The pathological consistency of the change of form is next investigated. It has to be determined whether it consists of fluid or gas, a solid structure or a combination of these. This fact is decided by a process of exclusion.

The degree of firmness of the area is compared with the normal by palpation and a general idea

of its consistency obtained in this way, a soft swelling usually suggesting a fluid mass, while a very hard firm one on the contrary usually is a solid one.

The fact that a mass or swelling consists of *fluid* is looked for in the following ways:—

(1) The feeling of an area of soft consistency surrounded by one of firmness and hardness is suggestive of the presence of fluid in the softer part.

(2) **Pitting on Pressure.**—Firm pressure is applied with one finger for five to fifteen seconds over a suspected area, selecting a part where counter pressure is available, as over a bone. After the finger has been removed, a depression is looked for and felt for. Its presence is known as pitting on pressure and is an indication of the presence of fluid in the tissue spaces or oedema.

The rate at which the depression disappears is noted as an idea of the degree of tension under which it is, and of the viscosity of the fluid may be gained from this fact.

(3) **Fluctuation.**—The suspected area is fixed by holding it with the thumb and the third, fourth and fifth fingers of the left hand, so as to prevent a displacement of the whole mass. The palmar surface of the left index finger is placed on one side of the area for the purpose of appreciating any difference that may occur in the degree of tension beneath it. Pressure is applied on the opposite side with the right index finger so as to displace the fluid beneath this spot. As the result

of doing so the left finger recognizes the increased tension and pressure beneath it. The examination should always be made in two diameters of the area at right angles with one another. The finding of this sign present in the two directions indicates that the contents of the tissues at this point are fluid in character.

Particular care should be exercised in looking for this sign where several muscles running in different directions overlie the suspected area, as in the buttock or ball of the thumb.

"The surgeon may fail to obtain the sense of fluctuation—

(1) Because of the great depth of the fluid.
(2) Because of the small size of the swelling, rendering the manipulation very difficult.
(3) Because of the extreme tension of the fluid.
(4) Because of the extreme lack of tension of the fluid.

He may wrongly suppose that he obtains the sense of fluctuation—

(1) If the tumour is very elastic.
(2) If the tumour is very soft.
(3) If the tumour is very movable."

(4) Fluctuation Wave.—This method is carried out by placing the palm and fingers of one hand on one side of the swelling, and then tapping the other side with the fingers of the other hand or some light hammer such as a pencil, when a distinct impulse is felt striking the examining hand

as the result of the wave produced. It should be obtained in more than one diameter. Care should be taken not to mistake a surface impulse for a wave of the contained fluid. The chances of doing this may be reduced by getting an assistant to apply light pressure to the surface between the two areas with the edge of his hand. The character of the wave may give a general idea of the viscosity of the fluid.

This sign is only looked for in large collections of fluid, such as occur in the peritoneal cavity from free fluid or from a large unilocular cyst.

Change in form that is due to *gas* is determined in the following ways:—

(1) By feeling a fine crackling sensation like tissue paper beneath the skin.
(2) By hearing a gurgling sound on manipulation.
(3) By hearing a tympanitic note on percussion, if the gas is present in sufficient amount.

If the above signs of the presence of fluid or of gas are absent, then we are justified in inferring that the change of form consists of a solid tissue structure.

The pathological nature of a *solid* swelling may be indicated by various characteristics.

(1) The degree of hardness or softness as appreciated on pressure either of the whole area involved or of its different parts.
(2) The shape of the change,

Globular, lobulated, nodular, warty, pedunculated or sessile.

(3) The changes in the overlying or adjacent surrounding tissues, such as fixation, retraction, distorsion, ulceration.

III. For Change in Motion.—The *passive* range of movement of any suspected part such as a joint, is ascertained by moving it without any voluntary power being used by the patient.

Any limitations of the complete arc of movement are recorded in degrees. Thus, the angle of the greatest extension (A.G.E.) might be 160°, and the angle of greatest flexion (A.G.F.) 100°, giving a range of movement of 60°.

Limitation of movement may be due to spasm of muscles, to presence of scar tissue or adhesions or to the presence of some solid structure mechanically interfering with it and the examination is made with the purpose of determining which of these causes is present in the particular case.

The effect that moving the part has on the colour or form is watched to see if it causes an alteration in the colour, position or shape of the part.

Palpation over an affected part while passively moving it, may be accompanied by a crepitant or grating sensation. At the same time actual grating may be heard.

Movement may be excessive at a joint or present in a part such as the length of a bone where it normally should be fixed.

Reflex movements are tested by either scratching the skin and watching for the reflex contraction of the related muscle or by striking a blow

on the tendon of a muscle and watching the activity of the degree of response of the muscle.

IV. For Change in Sensation.—In giving the history, the patient describes the location in which pain is felt and the directions in which it is referred. They also describe the character of the pain felt and its duration.

On examination by palpation, the degree to which the local sensation of the part is increased by pressure is appreciated. It is useful to speak of pain produced in this way as tenderness to differentiate it from the pain complained of by the patient. The first thing to look for with tenderness is its anatomical position, and its extent on the surface. Next, to learn the depth in the tissue at which it appears to be greatest. This is looked for by trying the sensation of the skin by light pressure or pinching it up or by touching with absorbent cotton or pricking with a pin. Pressure is then applied more and more deeply to learn the relation of the tenderness to the muscle, bone, joint or any special viscus.

It is important to determine whether the area of tenderness corresponds or not to the area of pain complained of by the patient, and to the area where a change in colour, form or motion is present. The effect of movement on both the pain and tenderness is tested for with the idea of learning its relation to muscles, tendons, ligaments, nerves or bones. The putting of these structures into action or on the stretch when they are affected or of moving the broken ends of a bone,

causes increased pain. The exact character of the tenderness may be useful in finding its cause. It may be itching, burning, smarting pain suggesting cutaneous inflammation or deep, boring pain suggesting bone, or shooting, lancinating, neuralgic pain suggesting nerve involvement.

The points covered on **Inspection and Palpation** might be summarized as follows:—

Inspection—

Colour.

1. Anatomical position.
2. Extent.
3. Shape and character of edges.
4. Particular colours present—shades—area of maximum change.
5. Changes in skin.

Form.

Seen as swelling, depression or irregularity.

1. Anatomical position.
2. Extent and size.
3. Shape and character of its limits.

Motion.

1. Effect of movement on colour or form.
2. Range of active movements.
3. Abnormal movements.
4. Abnormal sounds.

Sensation.

1. Changes in facial expression as result of disease or pain.

3. Changes in position or habitus as result of pain, e.g., restlessness or stillness.

Palpation—

Colour.

1. Temperature.
2. Effect of light pressure.

Form.

1. Anatomical position.
   Determined by its site and the degree of fixation to or mobility on tissue layers or organs.
2. Pathological nature—
   (a) Degree of hardness or softness.
   (b) Shape.
   (c) Consistency.
   Fluid.
   1. Soft centre.
   2. Pitting on pressure.
   3. Fluctuation.
   4. Fluctuation wave.

   Gas.
   1. Crackling sensation under skin.
   2. Gurgling sound.
   3. Resonance on percussion.

   Solid.
   1. Absence of above signs.
   2. Degree or hardness.
   3. Tissue involved.
   4. Condition of overlying skin.

Motion.

1. Effect of passive movements on colour or form.
2. Range or limitation of passive movements.
3. Presence of grating sensation or sounds.
4. Reflexes.

Sensation.

1. Anatomical position, extent, depth.
2. Relation to changes in colour, form or motion.
3. Relation to area of pain complained of.
4. Character and degree.

The following are applications of the above described method of examination to certain common conditions:—

LOCAL EXAMINATION OF AN ABSCESS.

Inspection—

I. —Colour Changes.

1. Anatomical position.
2. Extent; shape; edges.
3. Particular colour—shades.
4. Changes in skin—glistening.

II. —Form (Swelling).

1. Anatomical position.
2. Extent; size; shape; edges.

III.—Motion.
1. Effect of active movement on redness.
2. Effect of active movement on swelling (Increase; decrease; displaced).
3. Range of active movement of part.
4. Location of pain produced by movement.

IV.—Sensation.
1. Facial expression.
2. Habitus.

Palpation—

I. —Colour.
1. Effect of light pressure; temperature.

II. —Form (Swelling).
1. Anatomical position and relations.
2. Consistency.
   (a) Central soft area.
   (b) Pitting on pressure; extent; degree; rapidity of return.
   (c) Fluctuation.

III.—Motion.
1. Effect of passive motion on redness or swelling.
2. Range of passive movement of part.
3. Presence of grating or crepitant sensation or sound.

IV.—Sensation (Tenderness).
1. Position; extent; depth.
2. Relation to area of pain and to changes in colour, form and motion.
3. Effect of movement.
4. Character and degree.

LOCAL EXAMINATION OF AN ULCER OR SINUS.

Inspection—

I. —Colour Changes.
   1. Anatomical position and number.
   2. Size; shape.
   3. Base (including discharge), edges and surrounding area.
   4. Changes in skin—glistening, wrinkled, desquamating; varicosities; eczema.

II. —Form (Swelling).
   1. Position.
   2. Extent; shape; edges.

III.—Motion.
   1. Effect of movement on colour or form.
   2. Range of active movement of part.
   3. Location of pain produced by movement.

IV.—Sensation.
   1. Facial expression.
   2. Habitus.

Palpation—

I. —Colour.
   1. Effect of light pressure; temperature.

II. —Form.
   1. Anatomical position and relations (depth).
   2. Consistency.
      (a) Degree of firmness of surrounding parts.
      (b) Pitting on pressure.

III.—Motion.

1. Effect of passive movement on colour or form.
2. Range of passive movement of part.
3. Presence of crepitant sensation or sound.

IV.—Sensation (tenderness).

1. Position; extent; depth.
2. Character and degree.
3. Relation to area of pain and to changes in colour, form or motion.
4. Character and degree.

Examination with a probe may be necessary to determine the depth and extent of the base or tract; to locate the exact site of tenderness or to look for the presence of dead bone or foreign body.

LOCAL EXAMINATION OF AN AREA OF GANGRENE.

Inspection—

I. —Colour.

1. Anatomical position.
2. Extent; shape; edges.
3. Particular colours—shades.
4. Changes in skin—dry and wrinkled; moist; blistering, discharging.

II. —Form.

1. Position and character—swelling or shrivelled.
2. Extent; size.

3. Shape and character of edges.
4. Effect of active movement.

III.—Motion.

1. Effect on colour or form.
2. Range of active motion.
3. Abnormal movement.

IV.—Sensation.

1. Facies.
2. Habitus.

Palpation—

I. —Colour.

1. Effect of light pressure; of pin prick: temperature.

II. —Form.

1. Position and relations.
2. Consistency
   (a) Hard and shrivelled; soft and easily broken down.
   (b) Pitting on pressure.
   (c) Crepitation from gas.

III.—Motion.

1. Effect of passive movements on colour form.
2. Range of passive movement.
3. Abnormal movement.
4. Presence of grating sensation or sound.

IV.—Sensation.

1. Position; extent; depth of loss of sensation with its degree.
2. Relations to area of pain and to change in colour, form or motion.

3. Effect of passive movement.
4. Character and degree.

V. —The odour of the area should be smelled for, and recorded.

LOCAL EXAMINATION OF A RECENT WOUND.

Inspection—

I. —Colour.

1. Anatomical position.
2. Size; shape; edges; surrounding area.
3. Appearance of divided tissues with character of hemorrhage or other discharge.

II. —Form.

1. Position; extent; shape; edges.

III.—Motion.

1. Effect of movement on colour or form.
2. Range of active movement of parts affected by wound.
3. Abnormal movement.
4. Location of pain produced by movement.

IV.—Sensation.

1. Facies.
2. Habitus.

Palpation—

I. —Colour.

1. Temperature; effect of light pressure.

II. —Form.
1. Identification of anatomical structures divided by use of probe or forceps.
2. Degree of hardness or softness.
3. Pitting on pressure.
4. Fluctuation.
5. Crepitation from gas.

III.—Motion.
1. Effect of passive movement on structures exposed in wound.
2. Range of passive movements of parts affected.
3. Presence of grating or crepitant sensation.

IV.—Sensation.
1. Position and extent of increase or decrease.
2. Relation to changes in colour, form or motion.
3. Relation to area of pain complained of.
4. Character and degree.

LOCAL EXAMINATION OF AN INJURED PART IN WHICH THERE IS NO OPEN WOUND.

Inspection—

1. —Colour.
   1. Position and extent.
   2. Shape and character of edges.
   3. Particular colours—area of maximum degree.

4. Changes in skin—roughening—blistering.

II. —Form (Swelling or deformity).

1. Anatomical position; extent; size.
2. Shape and character of limits.

III.—Motion.

1. Effect of active movement on colour or form.
2. Range of active movement.
3. Abnormal movements.
4. Abnormal sounds.

Palpation—

1. —Colour.

1. Effect of light pressure; temperature.

II. —Form.

1. Anatomical position and depth with relation to prominent anatomical points or bones.
2. Degree of fixation to or mobility on tissue layers or organs.
3. Consistency.
   (a) Soft area with hard edges.
   (b) Pitting on pressure.
   (c) Fluctuation.
   (d) Solid edges of displaced bone.
4. Relations of prominent bony points to one another.
5. Measurements.

III.—Motion.

1. Effect of passive movement on colour or form.

2. Range of passive movement.
3. Presence of abnormal movement.
4. Presence of abnormal sounds or sensations.

IV.—Sensation (Tenderness).

1. Anatomical position; extent, depth and relations.
2. Relation to changes in colour, form or motion.
3. Relation to area of pain complained of.
4. Character and degree.

EXAMINATION OF THE ABDOMEN.

Inspection—

I. —Colour.

1. Position; extent, shape, colour.
2. Particular colour.
3. Changes in skin—striae; cracks; scars; veins; umbilicus.

II. —Form.

1. General shape—bulging; retracted, with effect of change of position.
2. Position of localized swelling with its size, shape and edges.

III.—Motion.

1. Range of movement of abdominal wall during normal respiration, with any area of limitation.
2. Effect of movement on any localized swelling.

3. Effect of movement resulting from coughing on any localized swelling.
4. Presence of any abnormal movements such as peristalsis; pulsation.
5. Presence of abnormal sounds—gurgling.

IV.—Sensation.

1. Facial expression—changes from degree of pain at various intervals and during increased respiration.
2. Habitus—still on back; restless and tossing; with knees drawn up.

Palpation—

1. —Colour.
   1. Effect of light pressure.
   2. Temperature.

II. —Form (Swelling).

1. Anatomical position.
   Mobility or fixation in relation to
   (a) Skin and subcutaneous tissue.
   (b) Muscles.
   (c) Any particular viscus.
2. Consistency.
   (a) Degree of hardness or softness; malleable; variation.
   (b) Pitting on pressure.
   (c) Fluctuation.
   (d) Fluctuation wave.
   (e) Shape; size.
   (f) Degree of resonance on percussion.

(g) Presence of gurgling.
(h) Movement on respiration.
(i) Presence of splashing sound.
(j) Effect of emptying viscus, e.g., bladder, stomach, colon.

III.—Motion.

1. State of abdominal muscles as to rigidity, noting its position, extent, degree and relations to underlying viscera.
2. Presence of gurgling.
3. Presence of moveable waves due to peristalsis.
4. State of abdominal reflexes.

IV.—Sensation (Tenderness).

1. Position; extent.
2. Depth at which elicited.
3. Point of maximum.
4. Relation to abdominal viscera.
5. Direction in which it is referred.
6. Degree of increase or relief by pressure.
7. Degree of increase on movement or respiration.

Percussion—

1. Presence of abnormal dulness. If so, whether fixed or movable.
2. Presence of abnormal resonance.
   (a) Of degree, e.g., distension with gas.
   (b) Of position, e.g., obliteration of liver dullness.

3. Ausculatory Percussion may be of use in determining above points.

Ausculation—

1. Presence of abnormal sounds.
   (a) Peristaltic gurgling.
   (b) Splashing.
   (c) Transmitted heart or breath sounds.
   (d) Foetal heart sounds.
   (e) Other adventitious sounds.

Rectal Examination—

For details see later.

Radiological Examination—

1. Fluroscopic examination and examination of photographic plates after Barium or Bismuth Meal.
2. Fluroscopic examination and examination of photographic plates after Barium or Bismuth Enema.
3. Fluroscopic examination and examination of photographic plates after injection of Oxygen into peritoneal cavity.

EXAMINATION OF THE RECTUM AND ANUS.

Position of the Patient—

1. On the left side.
2. On the back, with thighs flexed and abducted.
3. On the knees and chest.

4. Bending over a chair.
5. Standing with one thigh flexed.
6. Squatting down.

Inspection—

I. —Colour.
   1. Position; extent; shape; character of edges.
   2. Particular colour.
   3. Changes in the skin or mucous membrane, e.g., ulcer, mouth of sinus or fistula, discharge

II. —Form.
   1. Appearance of anal orifice—normal; retracted; patulous.
   2. For mass or lump, noting its position, extent, shape and relations.
   3. Whether effected by straining.

Palpation (Digital Examination)—

1. —Colour.
   1. For effect of light pressure.

II. —Form.
   1. Anatomical position.
      (a) Fixation or mobility—reducible or not.
      (b) Relations to anus, rectum, prostate, urethra, bladder, vesiculae seminales, recto-vesical pouch, appendix, bones of pelvis—in female, vagina, uterus, ovaries, tubes.

2. Consistency.
   (a) Degree of hardness or softness.
   (b) Pitting on pressure.
   (c) Fluctuation.
   (d) Shape.
3. Presence of stricture, noting site, shape and degree.

III.—Motion.

1. For relaxation or spasticity of sphincter muscles.

IV.—Sensation (Tenderness).

1. Position; extent; depth; character and degree.
2. Relation to mass or above structures.
3. Effect of straining.

Speculum, Proctoscope or Sigmoidoscope may be of value in aiding inspection.

EXAMINATION OF A CASE OF INJURY TO THE HEAD.

Inspection—

I. Colour—Contusion or wound.

1. Position; extent; shape; character of edges.
2. Particular colour.
3. Appearance of divided tissues with character of hemorrhage or other discharge from this or from nose, mouth or ears.

II. —Form—Swelling or irregularity (depression).

1. Position; extent; shape; edges.

III.—Motion.

1. Ability to carry out voluntary movements.

   Test eyes, face, tongue, arms, legs, noting position and degree of loss of power.

2. If unconscious, look for altered position from loss of power, e.g., irregular pupils, strabismus, loss of normal wrinkles on face, unusual position of arm or leg.
3. Presence of abnormal movements. Twitching; spasm; convulsions.
4. Character of respiratory movements.

IV.—Sensation.

1. Signs of mental change.
   (a) Confusion; loss of memory; inattention; drowsy; stupid; unconscious; deep coma.
   (b) Irritable disposition; delirium; mania.
2. Facies indicating pain.
3. Response of pupils to light.
4. Response to sounds.

Palpation—

1. —Colour—with hand or probe.
   1. Temperature.
   2. Effect of light pressure.

II.—Form.

Swelling or irregularity.

If wound—examine with probe.

1. Anatomical position.
   (a) Extent; shape; edges.
   (b) Mobility or Fixation of different layers.

III.—Motion.

1. Presence of abnormal movement in bones.
2. Test arms and legs for loss of power or tone and for spasticity.
3. Condition of reflexes—superficial and deep.

IV.—Sensation.

1. Position of localized tenderness, noting:
   (a) Extent and depth.
   (b) Relation to scalp or skull.
   (c) Relation to area of pain.
2. Response to
   (a) Touch.
   (b) Pin-prick.
   (c) Heat or cold.

EXAMINATION OF A CASE OF INJURY OR DISEASE OF SPINE.

Inspection—

I. —Colour—Bruising.

1. Position; extent; shape.
2. Particular colours.

II. —Form.

1. Conformation of back.

(a) Increase or decrease of natural curves.
(b) Undue prominence of any one or more spinous processes.
(c) Lateral deviation of spinous processes.
(d) Prominence or flattening of angles of ribs.
(e) Height and prominence of scapulae.
(f) Level of Iliac crests.
(g) Hollow of waist on each side.

2. Effect of active movements on these.
e.g., stooping, lateral bending, rotation of head and shoulders.

III.—Motion.

1. Effect of movement on colour or form.
2. Range of active movements with their limitation.
3. Presence of abnormal movement or fixation.

IV. —Sensation.

Facial expression and habitus.

Palpation—

I. Colour.

Effect of light pressure; temperature.

II. —Form.

1. Conformation of back.
Feel for some changes as on inspection.
2. For swelling, indicating abscess formation.

(a) Cervical region—posterior triangle or supra-sternal notch.
(b) Lower Dorsal or Lumbar region.
1. In Lumbar region of back.
2. Above crest of ilium.
3. In abdomen in site of psoas or iliacus muscle.
4. In thigh over insertion of these muscles.

III.—Motion.
1. Feel muscles of back for presence of spasm.
2. Range of passive movement.
(a) By raising head.
(b) By raising patient with feet.
3. Effect of passive movement on form.

IV. —Sensation (Tenderness).
1. Presence on pressure.
(a) Over spinous processes.
(b) Over intervertebral foramina.
(c) By pressing down on head or shoulders.
(d) By jarring feet.

IF INVOLVEMENT OF SPINAL CORD SUSPECTED.

Inspection—

I. —Colour.
For bed sores or for ulcer.

II. —Form.
For change in size of arms or legs from atrophy.

III.—Motion.

Range of active movement of arms and legs.

Palpation—

I. —Form.

For hardness or softness of arms and legs indicating spasticity or atrophy.

II. —Motion.

1. Degree of resistance to passive movement of arms or legs.
2. Increase or decrease of deep reflexes.

III.—Sensation.

1. Alterations in sensation to
   (a) Touch, (Absorbent cotton).
   (b) Pin prick.
   (c) Heat or cold.
2. Increase or decrease of superficial reflexes.
3. Alterations in visceral reflexes.
   (a) Incontinence or retention of urine.
   (b) Incontinence or retention of faeces.
   (c) Priapism.

EXAMINATION OF THE CHEST.

Pathological changes may occur within the thorax for which surgical treatment may be necessary. The methods of examination required to determine the presence of such changes as occur in empyaema, abscess of the lung, blood or

air in the pleural cavity, should be familiar to the student.

Inspection—

1. —Colour.

   Not usually present.

II. Form.

   1. General shape—normal; flat; barrel; pigeon breast.
   2. Presence of bulging or retraction on one side or of intercostal spaces, noting its position and extent.

III.—Motion.

   1. Range of movement of two sides during normal respiration.
   2. Range of movement during exaggerated respiration.
   3. Effect of movement on any changes of form such as in II. 2.
   4. Rate; rhythm and type of respirations.

IV. —Sensation.

   1. Facial expression—changes from occurrence of pain from normal or exaggerated respiration.
   2. Decubitus.

Palpation—

I. Form.

   1. Anatomical position of change of shape with its extent and resistance to compression.

2. Consistency.
   (a) Degree of hardness or softness of intercostal spaces.
   (b) Pitting on pressure.

II. —Motion.
1. Range of movement of two sides during normal and exaggerated respiration.
2. Effect of respiration on any change of form.
3. Presence of abnormal sensations.
   (a) Pleuritic friction.
   (b) Rales.
   (c) Vocal fremitus.

III.—Sensation.
1. Anatomical position and extent.
2. Relation to changes in form or motion.
3. Relation to area of pain complained of.
4. Character, degree and time at which it occurs during respiration.

Percussion—

Sound.

Changes in the normal resonance of the lungs, noting their position, extent and alteration from change of position of patient.

1. Quantitative.
   (a) Diminution with its degree from slight impairment to absolute dullness or flatness.
   (b) Increase.

2. Qualitative.
   (a) Degree of tympany—high; medium.
   (b) Unusual tympany.
   Skodaic, boxy, cracked-pot, Bell sound, amphoric.

Auscultation—

Sound.

1. Character of respiratory sounds with their variations, noting their position and extent, or their disappearance.
2. Changes in Vocal resonance.
   (a) Quantitative.
   Increase or decrease.
   (b) Qualitative.
   Aegophony or Amphoric resonance.
3. Presence of abnormal sounds.
   (a) Rales.
   (b) Friction.
   (c) Splashing.

PART FOUR.

BIBLIOGRAPHY.

LITERATURE has been referred to as one of the sources of data for the purpose of arriving at a diagnosis. A student when he begins his clinical work in Surgery purchases one of the standard text-books on the subject of which a number of excellent ones are published. He finds sooner or later that this does not contain just what he expected and to assist him in making diagnosis, he gets one of the books on Surgical Diagnosis, such as the Elements of Surgical Diagnosis, by Pearce Gould, or a larger one such as Clinical Surgical Diagnosis, by de Quervain. When he comes to treat a case, he feels the lack of detail of minor surgical technic and procures a book on this subject. But few undergraduates are financially able to buy more than the above, although occasionally a man will treat himself to one of the works on Operative Surgery.

Even as early as his second year in clinical Surgery, he realizes that the books he has merely give him an introduction to the general principles of a particular subject. Should he wish to look further into the literature on some problem, he is confronted by the difficulty of not knowing just

how to go about it or where he may be able to find the type of material for which he is looking. This difficulty often appears so embarrassing that he hesitates to undertake it.

In order to give the student an idea of the books published on the various divisions of surgery, a list has been prepared, giving the title of the book, the author's name and the year in which it was published. By consulting this, the student will be in a position to go to a Medical Library and ask for any particular book that he considers will contain the ideas for which he is looking. He will in this way be saved valuable time in plodding through extensive catalogues or indexes and will attain his object much more quickly. He will discover that it is often necessary to consult several authorities before finding what he is looking for.

In giving him the names of the men who have devoted special attention to a particular subject, an idea will be gained of the authors, to whom he will have to refer in recent literature and journals in order to learn the most recent developments. Most of the publications are those that have appeared since 1900. Many older books were the recognized authorities of their day, but surgery is advancing so rapidly that they have not been included as essential, although from a historical and literary standpoint, it is of the greatest interest to delve into their depths.

"The men I speak of keep alive in us an interest in the great men of the past and not alone in their works, which they cherish, but in their lives,

which they emulate. They would remind us continually that in the records of no other profession is there to be found so large a number of men who have combined intellectual pre-eminence with nobility of character. This higher education so much needed to-day, is not given in the school, is not to be bought in the market place, but it has to be wrought out in each one of us for himself; it is the silent influence of character on character and in no way more potently than in the lives of the great and good of the past, in no way more than in 'the touch divine of noble natures gone'." (Osler). Publications in other than the English language have been omitted as they can only be utilized by the occasional student, who can find such if he desires in the one of the Indexes and Catalogues listed.

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